



"RED BOOKS" of the

BRITISH FIRE PREVENTION COMMITTEE.—No. 198.

Edited by the Executive.

FIRE TESTS WITH GLASS

A TEST

With Three Window Openings filled in with
"WIRED GLASS"

MESSRS PILKINGTON BROTHERS, LIMITED
ST HELENS

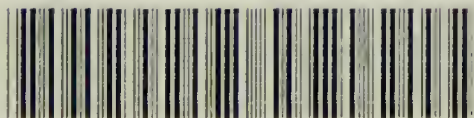
The Committee's Report.

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LONDON, 1914

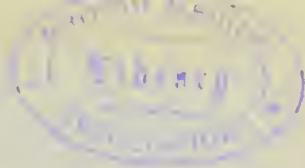
PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899)
8 WATERLOO PLACE, PALE MALL

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8 WATERLOO PLACE, Pall Mall.

Two Shillings and Sixpence



Fig. 12. VIEW AFTER 60 MINUTES' FIRE AND WATER TEST (FROM PASSAGE SIDE) page 2

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Offices:

8 WATERLOO PLACE, Pall Mall, LONDON, S.W.



Fig. 11. VIEW AT CLOSE OF 60 MINUTES' FIRE TEST.

NOTE

The Report on the test here presented is a further useful contribution to the Committee's test records on the fire resistance of various forms of special glazing, as it again indicates that "wired glass" is being commercially produced in Great Britain that can serve most efficiently to stop the spread of a fire of considerable severity, if properly applied.

This test should be read in conjunction with Report No. 197, where window openings similarly glazed were under fire test for 90 minutes.

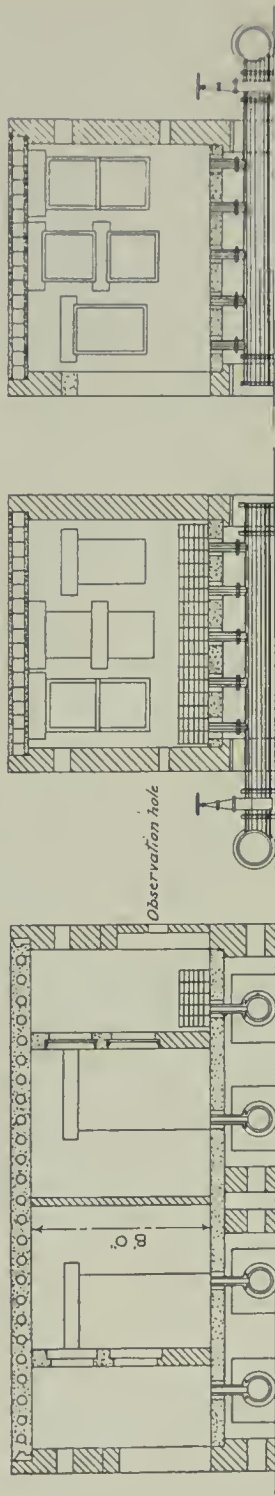
In this case the test was one of 60 minutes, but a casement was included that measured 3 feet by 2 feet ($0.914m.$ by $0.61m.$), i.e., had a superficial area considerably in excess to that allowed in various existing regulations, where 2 feet by 2 feet ($0.61m.$ by $0.61m.$) is the present maximum for fire-resisting glazing.

Classification of "Temporary Protection" (Class B) under the Committee's Standards has been accorded, which classification requires a fire test of one hour's duration at temperatures reaching 1500° Fahr. (815.5° C.), followed by the application of water under pressure.

ELLIS MARSLAND.

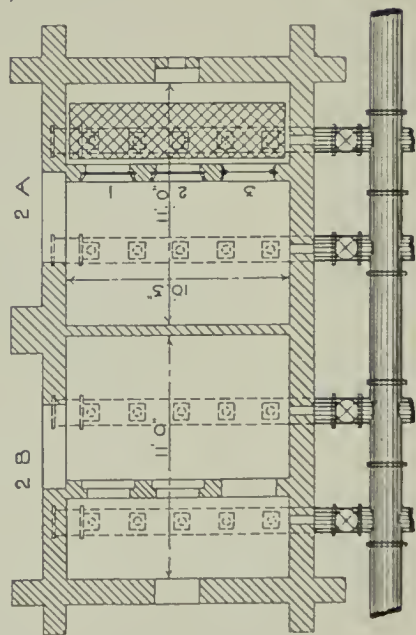
*The Offices of the
British Fire Prevention Committee,
8 Waterloo Place,
London, S.W.*

October, 1914.

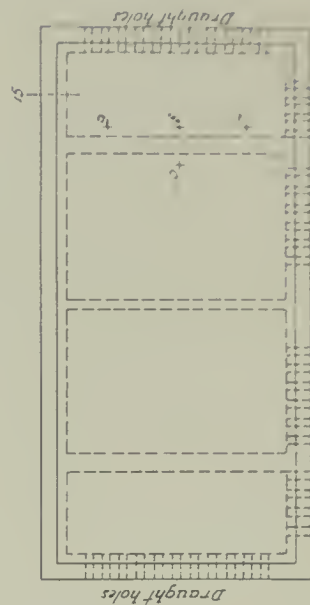


SECTION LOOKING EAST

SECTION LOOKING NORTH SECTION LOOKING SOUTH



PLAN OF HUT



PLAN OF ROOF

NOTE: The roof is made of corrugated iron, and the walls are made of concrete. The floor is made of concrete, and the ceiling is made of corrugated iron. The hut is built on a concrete foundation.

OFFICIAL REPORTS
OF THE
British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899]

FIRE TESTS Nos. 198 d, e, f, JULY 22, 1914

Three Window Openings filled in with

WIRED GLASS

BY

MESSRS PILKINGTON BROTHERS, LTD.

ST HELENS

SECOND TEST

OBJECT OF TEST.

To record the effect of a fire of 60 minutes' duration, the temperature to reach 1500° Fahr. (815·5° C.) but not to exceed 1650° Fahr. (898·8° C.) followed by the application of water for two minutes on the fire side with the view of being classified as affording Temporary Protection (Class B).

Note.—The Openings were numbered Nos. 1, 2 and 3.

Opening No. 1.—The glazing was bedded in a brick reveal and was in one square.

Opening No. 2.—The glazing was bedded in a brick reveal and was in two lights with a concrete transom between.

Opening No. 3 was filled in with a steel frame divided into two lights into which the glazing was fixed by angle iron stops.

SUMMARY OF TEST.

Within $\frac{1}{2}$ minute of lighting the gas the glazing in each opening commenced to crack in various directions and continued to do so during the test.

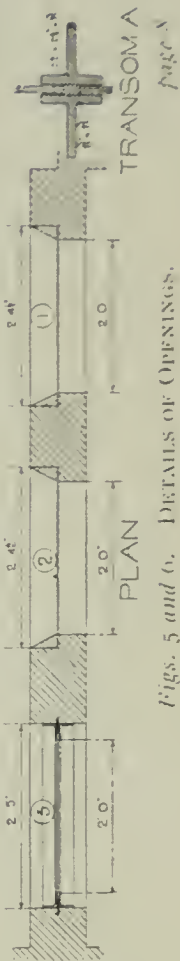
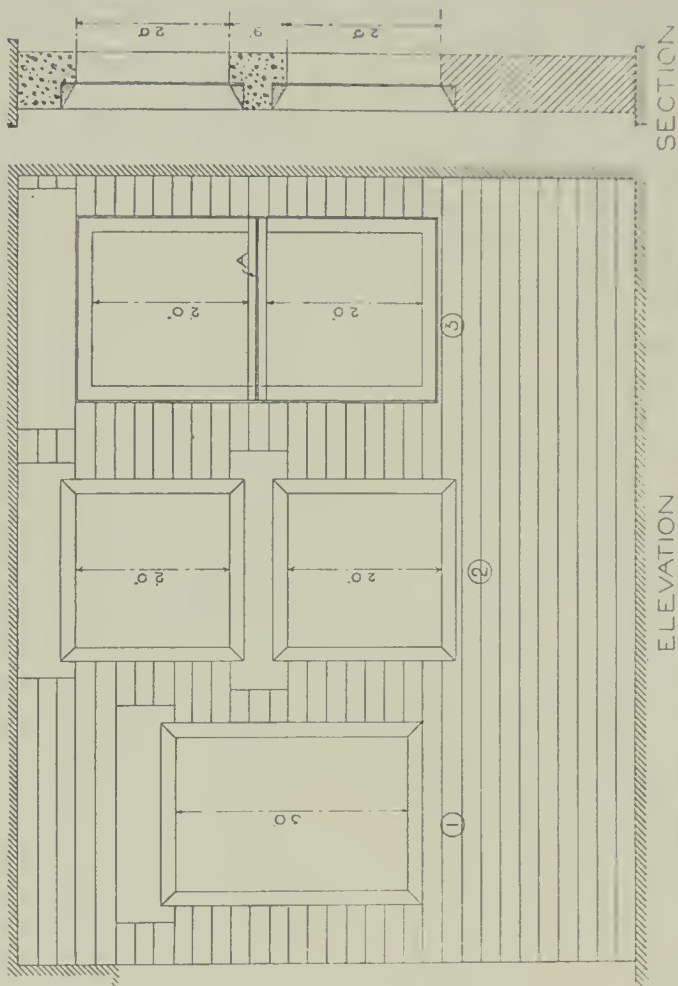
Opening No. 1.—In 5 minutes the glazing commenced to flake on the fire side and continued to do so for a further period of 5 minutes.

In 45 minutes bulging was observed inwards at the bottom and outwards at the top.

At the conclusion of the test neither fire nor water had passed through the glazing.

The glazing remained in position after the application of water; it was cracked and sintered all over.

WIRED GLAZING



Figs. 5 and 6. DETAILS OF OPENINGS.

Opening No. 2.—In 11 minutes the glazing of upper light commenced to flake on the fire side, which continued for 1 minute.

In 50 minutes the glazing of bottom light was slightly bulged outwards.

At the conclusion of the test neither fire nor water had passed through the glazing.

The glazing remained in position after the application of water; it was cracked and sintered all over.

Opening No. 3.—At the conclusion of the fire test fire had not passed through the glazing. On the application of water the glazing in the lower light was perforated at the top portion and some water came through. The glazing was in position after the application of water; it was cracked and sintered all over.

Classification: "Temporary Protection" (Class B) was obtained.

DESCRIPTION OF THE TESTING PLANT.

(See Figs. 1 to 4.)

The testing chamber was located at the Committee's Testing Station, being the southern half of Hut No. 2, and known as No. 2A.

The chamber was constructed as shown of stock bricks in lime mortar and measured internally 10ft. 3in. by 11ft. (3.124m. by 3.353m.). The ceiling was 8ft. (2.438m.) above the floor of the chamber and was constructed of concrete.

The chamber was divided by a 9in. (0.229m.) wall into two compartments, measuring 3ft. 9in. (1.143m.) and 6ft. 6in. (1.981m.) respectively and 10ft. 3in. (3.124m.) long.

The three window openings were formed in the 9in. (0.229m.) wall dividing the chamber and the heads were formed by concrete lintols.

There was a door opening into the larger compartment on the east side and one into the smaller compartment on the south side, which latter was bricked up with 4½in. (0.114m.) brickwork and an observation hole was formed in same protected by a sheet iron shutter.

The fuel used was gas produced at the station, the supply being regulated by valves and dampers.

The gas was admitted through a mixing chamber of fire bricks into the northern compartment as indicated on Figs. 1 to 3.

Pitkin-White pyrometers were used for recording temperatures and records were taken at points Nos. 7, 8, 9, 10 and 15, Nos. 7, 8, 9 and 15 being in the smaller compartment and point No. 10 in the larger compartment (see plan). Point No. 15 was self-recording.

There were ventilation holes in the upper portion of the west and north walls.

The photographs were taken by daylight.

The stream of water was applied through a hose and branch with a ¾in. (0.019m.) nozzle supplied from a small steam fire engine equipped with a pressure gauge.

DESCRIPTION OF THE FRAMES AND GLAZING.

(See Figs. 4, 5, 6, and 7.)

Opening No. 1.—The sight size of the opening was 2ft. by 3ft. (0.61m. by 0.914m.). There was a 2¼in. (0.057m.) reveal all round into which the "wired glass" was bedded by a wide splayed cement fillet. The glazing was "wired rolled" ¼in. thick (0.006m.).



Fig. 7. VIEW BEFORE TEST (FROM PASSAGE SIDE).

Opening No. 2.—The sight size of the opening was 2ft. by 4ft. 9in. ($0.61m.$ by $1.448m.$) and was divided into two lights each 2ft. by 2ft. ($0.61m.$ by $0.61m.$) by a 9in. by 9in. ($0.229m.$ by $0.229m.$) concrete transom. There was a $2\frac{1}{4}$ in. ($0.057m.$) reveal all round into which the "wired glass" was bedded by a wide splayed cement fillet.

The glazing in the upper and lower lights was "wired rolled" $\frac{3}{8}$ in. ($0.01m.$) thick.

Opening No. 3.—The sight size of the opening was 2ft. 5in. by 4ft. 8in. ($0.737m.$ by $1.422m.$) into which a steel frame was built formed by two angle irons each $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. ($0.063m.$ by $0.063m.$ by $0.006m.$) separated by a $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. ($0.063m.$ by $0.006m.$) distance piece forming a groove for the glazing.

The frame was divided into two equal lights by a double tee iron transom $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. ($0.063m.$ by $0.063m.$ by $0.009m.$) separated by a $\frac{3}{4}$ in. by $\frac{3}{8}$ in. ($0.019m.$ by $0.016m.$) distance piece. The sight size of the lights was 2ft. by 2ft. ($0.61m.$ by $0.61m.$).

Between the angle irons of the frame and into the groove formed by the distance pieces the glazing was fixed.

The glazing in the lower light was "wired polished" $\frac{1}{4}$ in. ($0.006m.$) thick and that in the upper light was "wired rolled" $\frac{1}{4}$ in. ($0.006m.$) thick.

LOG OF THE TEST.

On July 22, 1914, the test was undertaken. At 3 p.m. the meteorological observations at the Botanic Gardens, Regent's Park, read as follows:

State of weather, Overclouded; Wind, N.; Barometer, 29.66in.; Attached Thermometer, 66° Fahr. (18.8° C.); Dry Bulb, 60° Fahr. (15.5° C.); Wet Bulb, 57.5° (14.1° C.); Remarks: Dull day with slight rain and wind.

The following is the log of the test:

OBSERVATIONS (on Passage side).

Time p.m.	No. 1 Opening Glazing in Brickwork.	No. 2 Opening Glazing in Brickwork.	No. 3 Opening Glazing in Steel Frame	Mins. elaps'd
3.30	Gas lighted.	Gas lighted.	Gas lighted.	0
3.30 $\frac{1}{2}$	Glass commenced to crack.	Glass commenced to crack.	Glass commenced to crack.	$\frac{1}{2}$
3.35	Flake off on inside 3 in. by $1\frac{1}{2}$ in. ($0.076m.$ by $0.038m.$) about 8in. ($0.203m.$) from bottom and 6in. ($0.152m.$) from right side also small flake 1in. by 1in. ($0.025m.$ by $0.025m.$) 6in. ($0.152m.$) from bottom and about central.			5
3.40	Circular flake about 3in. by 2in. ($0.076m.$ by $0.051m.$) adjoining last.			10

Time p.m.	No. 1 Opening Glazing in Brickwork.	No. 2 Opening Glazing in Brickwork.	No. 3 Opening Glazing in Steel Frame.	M. in.
3.41		Flake off upper light 3in. by 2in. (0.076m. by 0.051m.) about centre and 7m. (0.178m.) from bottom edge.		11
3.42		Flake last mentioned increased to 6in. (0.152m.).		12
4.15	Slight bulging in- wards at bottom part of glazing and out- wards at top part.			4'
4.20		Glazing of bottom light slightly bulging outwards.		60
4.30	Gas turned off. Fire test closed. Fire had not passed through the glazing.	Gas turned off. Fire test closed. Fire had not passed through the glazing.	Gas turned off. Fire test closed. Fire had not passed through the glazing.	60
4.32	Water was applied to the inside of the glazing of all openings through the south opening of the hut for two minutes through a $\frac{3}{4}$ in. (0.019m.) nozzle at a pressure of about 60 lbs. (4.04 atmos.), and at the conclusion of the test the whole of the glazing in the several openings remained in position. The water caused the glazing to be cracked and sintered all over. Water passed through the lower light of opening No. 3, which was bulged out at top part and there were some small holes.			

OBSERVATIONS AFTER TEST.

*Taken July 23, 1914.**(See Figs. 8, 9, 10, 11, and 12).*

OPENING No. 1.

OUTSIDE.

The whole surface of the glazing was cracked and sintered.

The square of glazing was bulged inwards $\frac{1}{4}$ in. (0.006m.) towards the top and bulged outwards $\frac{3}{4}$ in. (0.019m.) towards the bottom.

There were four small perforations in centre part and one spot 1in. by $\frac{1}{2}$ in. (0.025m. by 0.013m.) flaked on surface down to the wire mesh.

INSIDE (FIRE SIDE).

Surface of glazing flaked in line with lower cracks.

OPENING No. 2.

OUTSIDE.

The whole surface of the glazing was cracked and sintered.

The upper light was bulged outwards $\frac{1}{4}$ in. (0.006m.).

The lower light was bulged outwards $\frac{1}{2}$ in. (0.013m.).

There was an open crack down centre of square and a few small pieces flaked off.

INSIDE (FIRE SIDE).

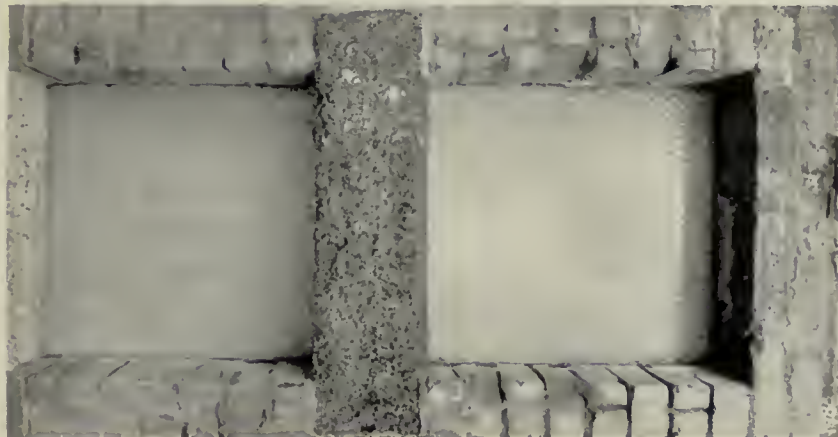
The surface of glazing of upper light was flaked on line of main crack.

There was slight flaking of lower light on line of main crack.

No. 3



No. 2.



No. 1.



Figs. 8, 9, and 10. VIEWS AFTER 60 MINUTES' FIRE AND WATER TEST (FROM FIRE SIDE).

OPENING No. 3.

OUTSIDE.

The whole surface of the glazing was cracked and sintered.

The upper light was bulged outwards $\frac{1}{2}$ in. (0.013m.).

The lower light was bulged outwards towards top edge 3 in. (0.076m.) in centre and drawn away from transom and the stopping displaced

Glass perforated at crown of bulge over an area of 5 in. by 5 in. (0.127m. by 0.127m.).

INSIDE (FIRE SIDE).

The steel frame was in alignment.

The wire mesh was exposed in lower light near top.

TEMPERATURES.

The temperatures read from observation records of pyrometer points Nos. 7, 8, 9, and 10.

Time p.m.	Inside of Testing Chamber.			Outside in passage.	Time elapsed.
	No. 7.	No. 8.	No. 9.	No. 10.	
	Fahr.	Fahr.	Fahr.	Fahr.	
3.35	700	600	1000		5
3.40	980	840	1260		10
3.45	1220	740	1320		15
	(660.0)	(393.3)	(715.5)		
3.50	1040	840	1300	200	20
3.55	1140	900	1380	—*	25
4.00	1200	980	1440	—*	30
	(648.8)	(526.6)	(782.2)		
4.5	1240	940*	1460	—*	35
4.10	1320	1000*	1440	205*	40
4.15	800	—*	1580	—*	45
	(426.6)		(860.0)		
4.20	1280	1180	1620	—*	50
4.25	1420	1340	1580	420	55
4.30	1560	1500	1620	490	60
	(848.8)	(815.5)	(882.2)	(254.4)	

The figures in italics are centigrade.

* It was raining at these periods and some water percolated down the pyrometer point tubes and prevented a proper reading.

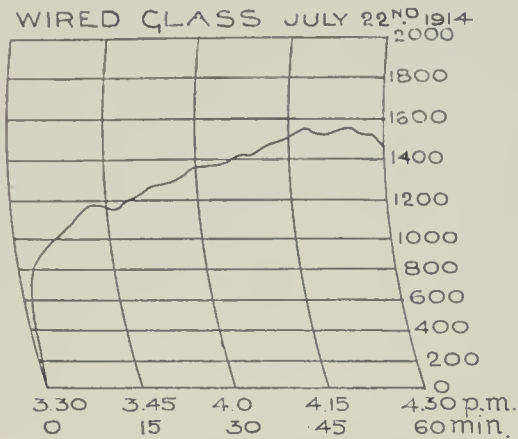
TEMPERATURES.

The following temperatures were recorded on the thermometers hanging 6 in. (0.152m.) in front of each opening on the outside in passage.

Time p.m.	Opening No. 1.		Opening No. 2.		Opening No. 3.		Min. elapsed.
	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	
3.30	62	16.6	62	16.6	62	16.6	0
3.35	106	41.1	100	37.7	110	43.3	5
3.40	180	82.2	160	71.1	180	82.2	10
3.45	200	93.3	205	96.1	200	93.3	15
3.50	—*	—	230	110.0	—*	—	20
3.55	—*	—	278	136.6	—*	—	25
4.0	—*	—	300	148.8	—*	—	30

* The thermometers had reached their maximum reading and were removed after 30 minutes, the heat was too great to take any further readings.

The following is the diagram taken from the self-recording point No. 15.



GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and was conducted by a Sub-Committee comprising:

Ellis Marsland (District Surveyor) (*Gen. Honorary Secretary*),
Directing Member.

Percy Collins, J.P., F.S.S., *Deputy Directing Member.*

Bertram Chatterton, A.M.Inst.C.E. (Insurance Surveyor), *Deputy Directing Member.*

J. Herbert Dyer.

R. W. Henderson, J.P., M.D. (Hon. Chief Officer, Rickmansworth Fire Brigade).

H. G. Marshallsay (Chief Officer, Aldershot Fire Brigade).

A. E. Nichols, M.Inst.C.E. (Borough Surveyor, Folkestone).

Stanley W. Thorpe (Chief Officer, Kodak Fire Brigade).

A. H. Lister (Engineer to the Committee) assisted the Sub-Committee.

The Council was represented for the testing operations of July 22nd, 1914, by:

The Right Hon. The Earl of Londesborough, K.C.V.O.

The Executive was represented for the testing operations of July 22nd, 1914, by:

Edwin O. Sachs, F.R.S.Ed., *Chairman.*

Oswald C. Wylson, F.R.I.B.A.

The Committee's Hon. Medical Officer, Major R. J. Maitland-Coffin, F.R.C.P., was in attendance on July 22nd, 1914, assisted by a sergeant of the St John's Ambulance Association.

The police arrangements were under the direction of Mr. D. W. Wood (Insurance Surveyor) and the Committee Rooms were in charge of Mr. J. W. Brooker (late Chief Officer, Weybridge Fire Brigade).

The general body of members was represented for the testing operations of July 22nd, 1914, by:

Messrs. S. G. Gamble, F.S.I., A.M.Inst.C.E. (Divisional Officer, London Fire Brigade); G. Hayles (Surveyor, Commercial Union Co., Ltd.); Louis T. Healy, A.M.Inst.E.E. (Surveyor, Royal Insurance Co.); F. W. Lance (Surveyor, North British and Mercantile Insurance Co.); F. G. Sneath (Liverpool, London, and Globe Insurance Co.); B. Sworder (Surveyor, Liverpool, London and Globe Insurance Co.).

The following subscribers and visitors attended at the Testing Station by special invitation of the Executive during the testing operations of July 22nd, 1914:

Messrs. M. D. Barton (Inspection Section, London Fire Brigade); J. I. Bell (Chief Officer, Kingston, Surbiton and District Fire Brigade); G. Bellhouse (Superintending Inspector, Factory Department, Home Office); C. Buchanan (Committee on Bulkheads, Board of Trade); H. R. Champness, M.V.O. (Committee on Bulkheads, Board of Trade); — Churchward (Exhibitions Branch, Board of Trade); J. Clunes (London Assurance Corporation); Professor Dobbie, D.Sc., LL.D., F.R.S. (The Government Chemist); Herbert W. Ely (Secretary, Office of the Agent-General for Tasmania); W. Harvey (Engineer, Office of the Agent-General for Tasmania); A. H. Honeywill (Surveyor's Department, Commercial Union Assurance Co., Ltd.); T. C. Hunter (Superintending Civil Engineer, Admiralty); — Jamieson (Head of Fire Section, Messrs. Harrods, Ltd.); A. J. Marshall (Architects' Division, H.M. Office of Works); H. A. McFerran (Chief Engineer, H.M. Office of Works); F. S. Miles (The Fine Art and General Insurance Co.); Captain Mitchell, R.E. (Royal Arsenal, Woolwich); F. J. Plaice (London and North Western Railway Co.); W. Pott, A.R.I.B.A. (Principal Architect, H.M. Office of Works); Col. W. R. Stewart (Assistant Director of Fortifications and Works, War Office); J. Symon; G. Townsend (Building Act Section, London County Council); Alderman Henry Tozer (Westminster City Council).

Messrs. Pilkington Brothers, Ltd., were represented on July 22nd, 1914, by:

The Hon. E. H. Cozens-Hardy; Messrs. L. Lackland, R. H. Mather, G. L. Pilkington, W. Smith.

Signed,

For the Sub-Committee conducting the Test:

ELLIS MARSLAND.

For the General Testing Arrangements Sub-Committee:

PERCY COLLINS.

BERTRAM CHATTERTON.

For the Executive:

EDWIN O. SACHS.

Published by the Committee as Verified a true copy of the
directed by the Executive. Report ordered to be published.

HORACE S. FOLKER.
(Hon. Treasurer).

SPENCER, GIBSON & SON
(Solicitors).

Date—October 14, 1914.

Date—November 4, 1914.

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